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THE DETECTOR

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SERVICE

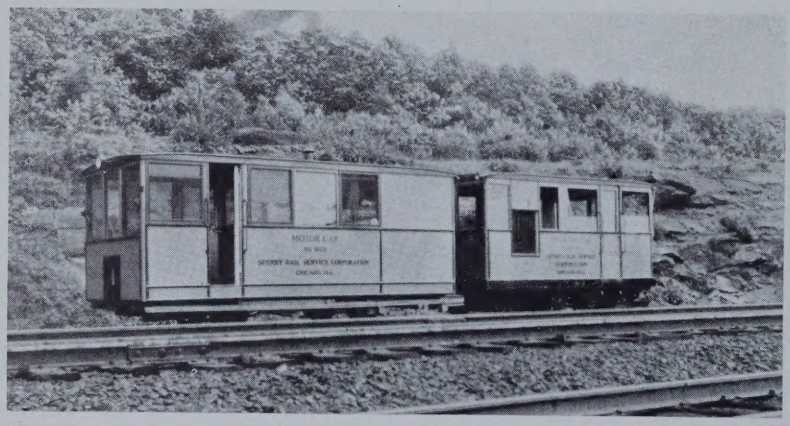
THE Sperry Rail Service Corporation was organized for the express purpose of furnishing a testing service to the railroads whereby the rails in track could be thoroughly tested and the presence of internal defects in them definitely located through the use of Sperry detector cars. It was realized at the outset that the detector car equipment was complicated and of a highly technical design, probably subject to frequent repairs and constant maintenance. It was further realized that its operation must of necessity be in charge of competent men familiar with all phases and possibilities of the equipment, and so trained as to not only know the equipment in that way but to be able also to properly interpret the results, or indications, obtained on the record. A familiarity with various rail and track conditions is also of importance in that connection, so that in view of all these matters this testing service becomes a semi-professional kind, similar to the inspection and testing of new rails.

Except in unusual cases, railroads generally favor contracting for special service of this character rather than trying to undertake it themselves. Thus they are relieved of the direct responsibility required by a highly specialized service, yet they can have the work done entirely under their general direction and supervision. They carry none of the burdens for the equipment or personnel, have no idle time to contend with, and the great advantage besides of having a third, or disinterested party, render judgment of important conditions.

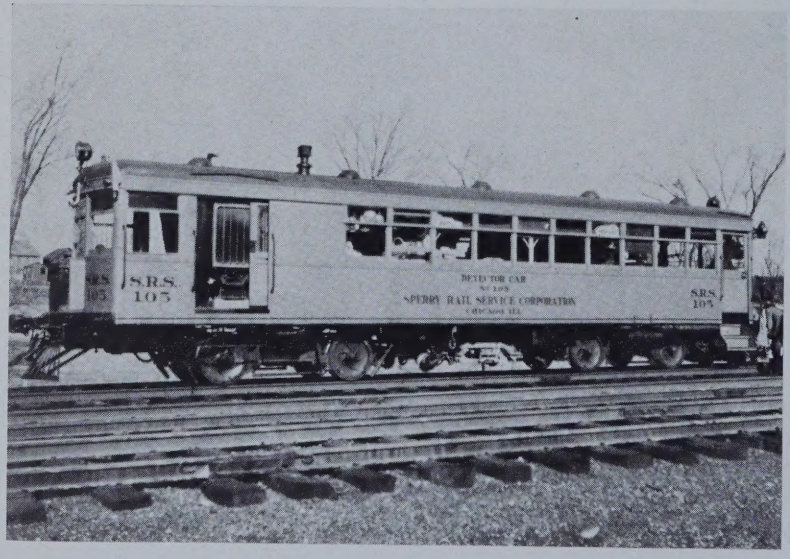
This is briefly the service we offer. Over 10,000 miles of track have been tested to date on 15 different roads. Four units are operating constantly and four new ones being built. Cars will be built as rapidly as the demand requires. The best of service for any railroad, anywhere, any time and for as long a period as necessary—that is our aim and suggestions and constructive criticism will be always welcomed.

SPERRY EQUIPMENT

SPERRY detector cars are of two distinct types. One is a double unit type consisting of a motor car of adequate capacity for hauling the trailing detector car. Each is a four wheeled car about 19 feet long, 8½ feet wide and 9 feet high above the rail. The forward, or motor, car contains, besides the gasoline engine, sleeping quarters for four men. There is a stove for heating, hot and cold water, radio, table, etc., so that our men have comfortable and convenient facilities for staying on the equipment at all times. The rear, or detector car, is divided into two compartments. The forward contains a gasoline motor direct connected to the generator. The main shaft also drives the exciter and an air compressor. The rear of the car is the recording room and in it are located the amplifiers, relays and recording table. The latter is at the rear windows so that the operator has a clear view of the track and rails at all times. The air controlled energizing brushes, the detector and paint guns are, of course, between the car wheels over each rail.



Sperry Double Unit Detector Car



Sperry Single Unit Detector Car

The single unit type of detector car is a Brill Model 55 gasoline driven. It is 43 feet long, mounted on two four wheel trucks. In the forward end is the driver's compartment, right back of which is the motor and generator room. Then there is a small sized kitchen, sleeping and living compartment and finally the recording room in the extreme rear, as in the double unit design. The brushes and other mechanism are between the two trucks underneath.

The principal difference in the types of equipment is, first, that the double unit can be loaded on to standard flat cars for transportation and, second, the maximum speed of the double unit is limited to about 30 miles per hour. The single unit cannot be loaded and so must be moved on its own wheels and usually under its own power. The higher speed obtainable, often 45 miles per hour, is something of an advantage at times, but perhaps offset because of the inconvenience of being considerably higher above the rails than is the double unit.

The speed of actual testing is 6 miles per hour, and testing can only be done when the cars are going forward. When backing up the brushes are automatically raised.

Three Sperry men are on each unit, but on the large single unit car a cook, or porter, is carried also. Each unit is in charge of a chief operator or superintendent. An assistant operator relieves him of the recording duties from time to time and assists in the general upkeep of the equipment. The third man is the motor car driver and he also takes care of the engines and running gear generally.

(Continued on Page 7)

BENEFITS OF TESTING RAILS IN TRACK

INDISPUTABLY the testing of rails in track is a safety measure demanded from every phase of railroad operation. Ever since the Lehigh Valley accident in 1911, when 29 people were killed because of a rail failure described for the first time as due to an internal transverse fissure, that type of failure has been outstanding as constituting the most serious menace to which rails are subject. In the interval to date some 70 people have been killed and 200 injured by the breaking of rails due to fissures. But while death and personal injury is one thing, the destruction of property, as in a freight train wreck, is another, often quite as expensive in the end. No definite statistics are available to show the cost of freight train accidents due to fissures, but cases where losses run to $75,000 and $100,000 are not rare.

Primarily designed to locate and record the presence of fissures in rails, the detector car now goes much farther. Split heads have always been a disturbing factor in rails, as have cracks under the head and in the web. These defects are "picked up" by the cars in the most surprising way and frequently the number of such defects located are greater than are the fissures found.

Known cases of fissures occur at a rate of about 7,500 per year in the United States. That is, these are the probable cases of rails taken from track because of the presence of fissures. They have been found visually by alert track men or perhaps by a warning established by the signals. The roughest estimate would indicate that in the last year the detector cars have found practically 1,000 more, and a very large percentage of those found are "air tight," that is, they are entirely interior, not having grown to the surface and therefore not giving any external indication of a defect whatsoever.

Certainly any means of detecting such menacing and hazardous defects is warranted from every standpoint. It is an insurance against trouble and an assurance toward safety. Use of detector cars is comparable with the demand for automatic signals whereby the number of collisions have been greatly reduced. Likewise the elimination of certain grade crossings is required from the viewpoint of safety to the public. The public demands safety in many directions.

The value of this new form of insurance cannot be estimated in dollars and cents any more than can the value of some other railroad enterprises, such as the elimination of grade crossings. Spending $100,000 to eliminate a grade crossing may appear extravagant, yet who can say what the cost of some disaster at that crossing might have been?

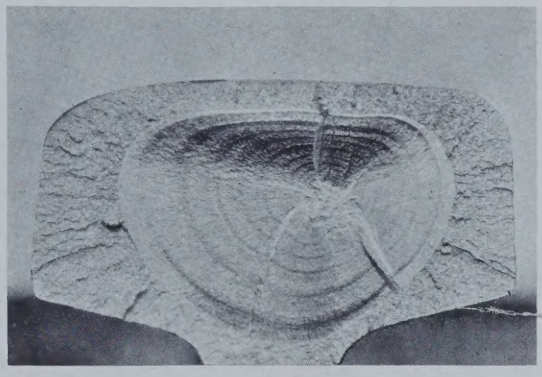
Every defective rail in track is a potential cause for disaster — some are of course worse than others — but no one can deny that the removal of one defective rail may easily effect a saving of thousands of dollars.

The rule of some roads requiring that all the rails of a heat be removed from track when a certain number of fissured rails develop has been a source of large expense. Generally the rails of such a heat are widely scattered and they have to be located and removed more or less singly. Estimates quite plainly show that the total cost of removing one heat is probably sufficient to run the detector car two or three weeks. Here, therefore, is a downright saving in favor of having the rails tested and the whole track made as safe as it is possible to humanly do.

Detector cars have been successfully operated now for more than a year. The experimental stage has been entirely passed. Having the tracks tested by Sperry detector cars means that everything has been done that it is possible to do to make them safe for public transportation.

RINGS ON FISSURES

Progressive fractures in steel generally display some sign indicative of their growth. Transverse fissures frequently exhibit rings of growth similar to the well known annular rings found in the trunk of a tree. A



very excellent illustration is seen in the accompanying photograph. Just what makes these rings on a fissure is a problem, but they certainly do not indicate a yearly development.

LARGE CUSTOMERS

SPERRY service was resumed on the Missouri Pacific on November 18th last, and it has been steadily operating ever since. New arrangements have just been consummated whereby this service will extend at least till September 1st, by which date practically their whole main line track will have been tested.

The New York Central and the Louisville & Nashville are other large patrons at the present time, with the Pennsylvania, the Wabash, the Frisco and the Texas & Pacific in the early future. Last year the Wabash, St. Paul, New Haven, Northwestern, Delaware & Hudson, Erie and Chicago & Eastern Illinois were among those served.

GROWTH OF FISSURES

THE detector cars have found transverse fissures in rails that have been in track barely a year. On one double track line there were practically eight times as many fissures found on the heavy traffic side as on the other where relatively lighter tonnage was carried. Two tests were made of a track with an interval of about ten months between them. On the second test only one-ninth the number of transverse fissures was found as on the first test, but approximately the same number of other defects were located in each test, so it would appear that a few fissures had certainly developed with the traffic of ten months. Four tests made by applying angle bars to small measured fissures and later retesting them showed that on an average the fissures increased in size some 30% in twenty-four days with approximately 500,000 tons of traffic.

All of these matters emphatically point to the need for a series of tests aiming toward the establishment of some facts and an empirical formula that will be a guide to the very important question of how often track shall be tested in order to keep it reasonably safe against fissures. Weeds return quickly to a freshly weeded lawn, bad teeth occur soon after the dentist's most careful examination, how fast do fissures develop and grow?

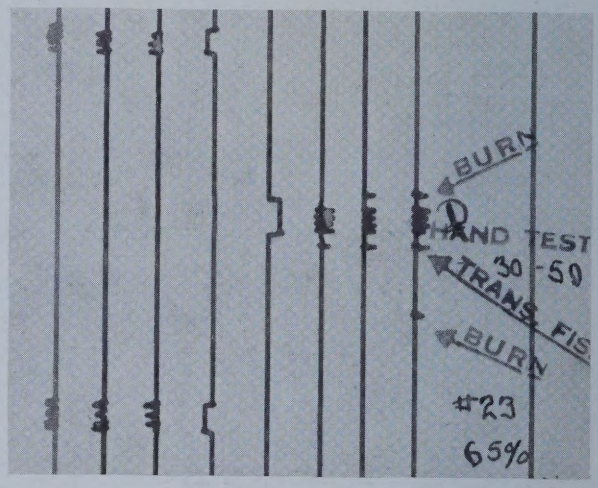
WINTER VERSUS SUMMER TESTING

Moisture from the air freezes on the cold steel rails very quickly at temperatures of less than 15°F and then testing becomes extremely difficult because of this thin coating of ice. Snow and sleet also, of course, bother the testing a good deal. It is therefore desirable to test northern tracks in the summer time and southern tracks in the winter. How completely one unit was tied up by snow is well shown in the picture.

Copies of "The Detector," and later editions which we purpose to issue from time to time, will be cheerfully furnished upon request.

THE RECORD

SOME patrons prefer that we make the record to a scale of $\frac{1}{32}$" per foot of rail and others $\frac{1}{16}$" per foot. This is really optional with the road. There is little choice. In one case twice the amount of paper is used as in the other and the record comes out twice as fast as when the small scale is used, this requiring the operator to work much faster. The large scale no doubt gives better definition at the rail joints, with the possibility that fissures close to the end of the joints will be easier located.

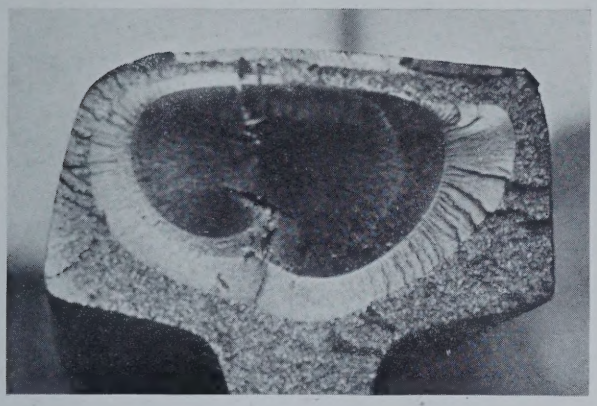


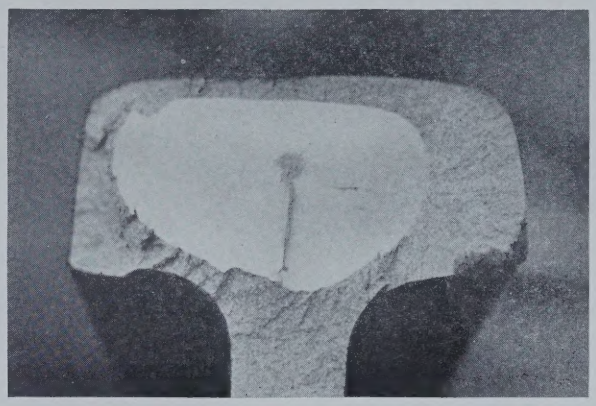
Here is a sample of the large record showing a 65% transverse fissure very near the end of the joint bars. Two engine burned spots are also shown.

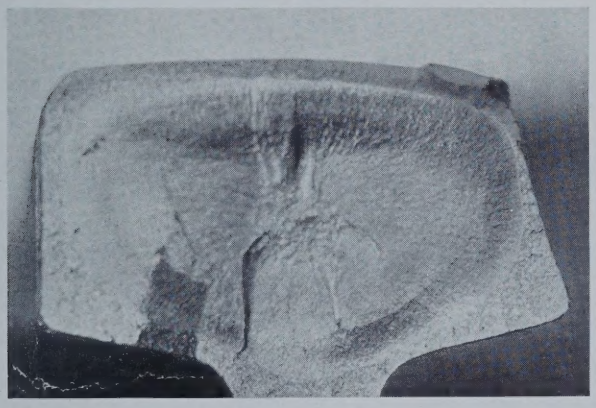
At the testing speed of 6 miles per hour, 8.8 feet of rail are covered per second, so that it requires about 4.25 seconds to test a 39 foot rail. The record is made on thin paper and can easily be blue printed. It is thoroughly annotated and marked for identification. The record is turned over to the railroad each day.

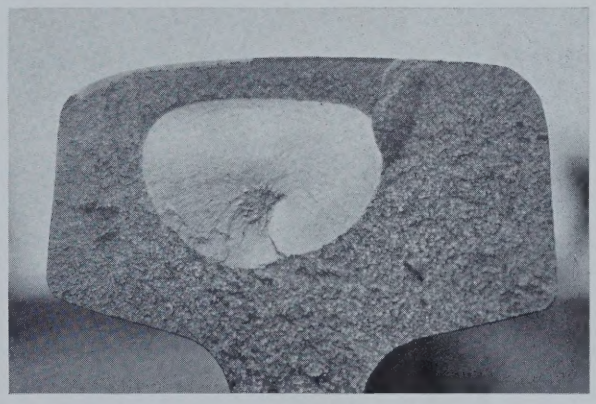
Detector car on the New York, New Haven & Hartford Railroad — near Bridgeport, Conn.

SAMPLE FISSURES FOUND BY DETECTOR CARS



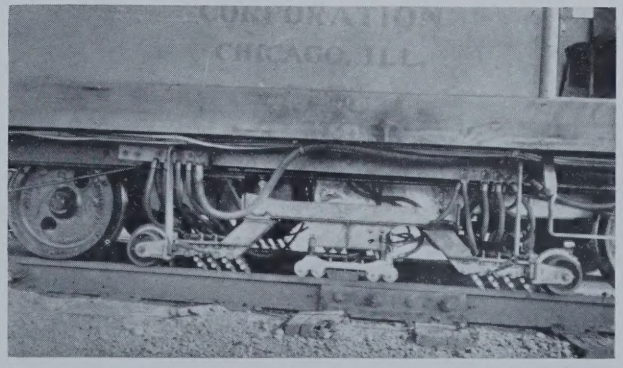






THE BRUSHES AND DETECTOR

UNUSUAL interest is always shown regarding the arrangement of the brushes under the detector cars for energizing the rails. These are shown in the accompanying picture. Of course there are two sets, one on each side for each rail of the track and they are entirely independent of each other. They are carried by two small wheels riding the rails between the main wheels of the car. These small wheels are connected by the frame work shown and the whole rigging is held down on the rail by compressed air operating on pistons in specially arranged cylinders.



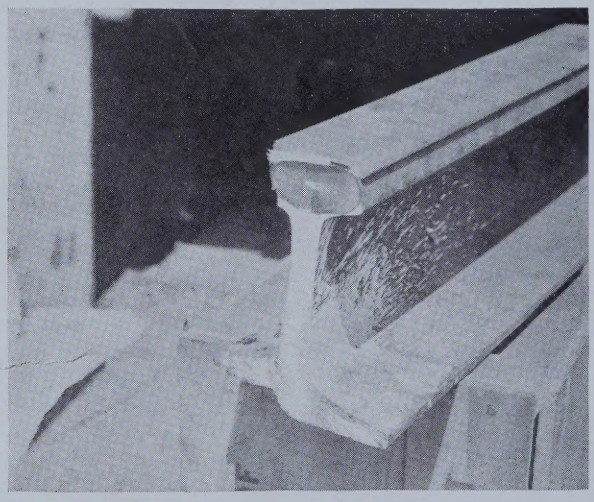
When running and not testing (running light) the air is released and the whole brush rigging raised several inches above the rails. The release and lowering of the brushes is electrically controlled and easily accomplished by the operator's merely pushing a button.

The detector is carried on an entirely separate mounting between the brushes, as seen over the joint in the picture, although it is attached to the brush frame and is accordingly raised and lowered with the brushes. The best form of detector mounting has been the subject of considerable work for it was very early found that corrugated rails affected operations more than anticipated. Such rails, of course, have high and low spots alternating every few inches and frequent false indications resulted. Corrugated rail appears to be much more common in steam road track than supposed, for it has long been regarded as confined almost entirely to electrically operated roads. The disturbance created by testing corrugated rail led to trials of several different forms for the detector mounting, but the best appears to be of the general type shown, consisting of small wheels in front and behind the detector itself and so arranged as to hopefully follow precisely the hills and valleys of the rail. While some delay is invariably encountered when testing corrugated rail, the general results have been much improved.

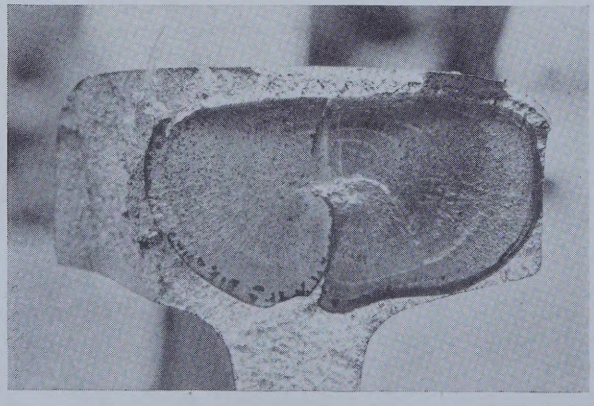
DEFECTS PAINTED

The detector car, besides making a paper record giving the full results of the track tested, also puts a daub of paint on the defective rail at the location of the defect.

Here a section gang is removing a painted defective rail from track,



which when broken shows a transverse fissure of a very large size at the paint mark



but which a close-up of shows had but very slightly (if any) reached the surface and which could not be found by any visual means.

SPLIT HEADS

WHILE the detector car was designed primarily for the purpose of locating and recording tranverse fissures in rails in track, its ability to detect various other types of internal defects has greatly increased its value to the railroads. Split heads in various stages of development are constantly being "picked up" by the cars when

no manifestation of the split can be found in any way. These two pictures show split heads of that kind. In both cases the split was too young to show any breaking

down of the angle bar fit or widening of the head, and of course there was no black streak on the running surface. These splits would probably grow very fast under continued traffic and serious results might easily have followed, but the detector car caught them in the earliest stages.

SPERRY EQUIPMENT

(Continued from Page 2)

Needless to say, the railroad must furnish pilotage, such as a conductor and flagman, to afford safe conduct over the road. In addition, such technical engineers as the road may care to have on board during the testing can be easily taken care of.

Sperry service is complete in every detail. Each unit of the most modern equipment is manned by three carefully selected, trained and supervised men. All supplies, such as gasoline, oil and paint, are furnished, or paid for, by Sperry, and all repairs, sustenance, etc., are provided by Sperry. The cost of our service is the total cost.

Sperry double unit detector car No. 103-502 travelled 350 miles on its own wheels and under its own power from late one afternoon to the next night. It was in prime condition and testing was resumed the morning after reaching destination. This is an illustration of how good the Sperry equipment can be kept in repair by Sperry men and its delicate and complicated apparatus maintained. Incidentally, on the first day of testing after this movement to a new railroad patron, the car found one transverse fissure, two horizontal fissures and two split heads.

PHOTOGRAPHING FISSURES

PHOTOGRAPHING transverse fissures is not an easy matter, for very often the result is apt to be disappointing if not misleading. The trouble is mostly caused by the fact that the fissured surface is smooth and easily reflects light as does a mirror. This picture shows a fissure located in a rail in track by a detector car. As usual with an air tight fissure there was no evidence of the defect anywhere on the surface of the rail. When broken the two ends disclosed the two bright silvery

surfaces exactly alike. Then they were photographed side by side. The result, however, makes the fissure in one end appear silvery and in the other dark. The dark appearing one might easily be mistaken for an oxidized fissure, that is, a fissure that has grown to the surface and become discolored by oxidation. Needless to say, considerable confusion may occur by trying to decide from a photograph whether a fissure is air tight or not.